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FUNGI THAT ENTRAP AND ASSIMILATE NEMATODES BY EMPLOYING CONSTRICTING RINGS

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INTRODUCTION: In the aeons of intimate association existent between nematodes and fungi in soil, some very complex parasite/host adaptations have evolved. One of the more complex adaptations is the development of constricting rings to entrap, hold fast and assimilate the motile, elusive, usually smooth worm-like body of nematodes. In the evolution of nematode prey trapping devices, the constricting ring is very likely the most advanced.

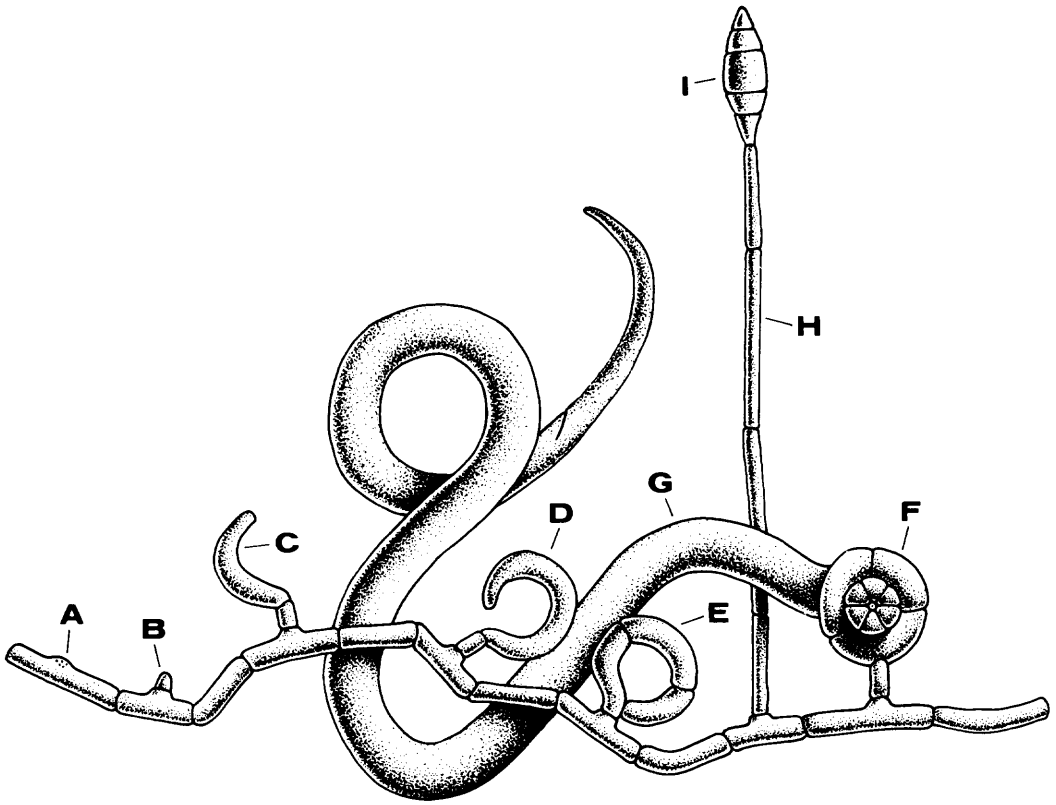

Fig. 1. A nematode entrapped by a constricting ring fungus. A. Constricting ring primordium. B. Elongation. C. Trap cell primordia. D. Trap cell closing. E. Three celled completed trapping ring. F. Trap closed about nematode anterior. G. Nematode. H. Conidiophore. I. Conidium.

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CHARACTERIZATION: All species in this group (Table 1) possess septate mycelia, 3-celled constricting rings (Fig. 1-E,F), simple conidiophores (Fig. 1-H) and conidia (Fig. 1-I).

Development of the trapping ring begins with a small swelling or bud on the vegetative hypha (Fig. 1-B), followed by elongation and septation. Then the hypha above the septation elongates and curves downward forming a loop (Fig. 1-C,D). Two more septa form in the loop (Fig. 1-E) and formation of the 3-celled trap is complete.

ENTRAPMENT: Figures 1-E,F and 2-B,C show the appearance of traps in the substrate. Nematodes enter the circular trap and body contact incites the 3 cells to rapidly inflate (about 1/10 of a second) (1) holding the nematode fast (Fig. 1-F, 2-A,C,D). With thinner nematodes (Fig. 2-C) or in older traps, the trap closes some distance down the nematode body. Many traps stand in isolation in the trapping site and nematodes have adequate space to evade the lethal loops. Instead they frequently retreat and press forward numerous times taking new directions until they almost always enter a ring. Following entrapment, most nematodes thrash wildly about in an effort to escape, many times inserting its tail into a nearby open trap engendering further entanglement (Fig. 2-D). On rare occasions, a nematode escapes after entrapment, leaving a closed trap in the substrate (Fig. 2-B). After 1/2 hr of slowly subsiding struggles, the nematode lies quiescent.

Fine hyphae emerging from the ring cells penetrate the moribund nematode and form a globose infection bulb internally. Trophic hyphae emanate from the bulb filling and assimilating the nematode body in about 24 hr. One or several hyphae emerge from the carcass producing vegetative hyphae in the substrate which in turn produce conidiophores and conidia (Fig. 1-H,I). A life cycle occurs in about 24-27 hr (4).

PREY: Nematodes representing almost all ecological types, such as bacteriophagous, mycophagous, phytoparasitic and predaceous nematodes encountered in soil are subject to entrapment. One of the limiting factors for entrapment is nematode size. Very large nematodes usually cannot enter the loops; however, a few large nematodes with sharply tapered heads may be trapped at the head only. Small nematodes such as *Wilsonema* sp. can pass through a trap safely.

Table 1. Genera and species of constricting ring fungi (3)

Arthrobotrys anchonia Drechs.
Arthrobotrys brochopaga (Drechs.) Schenk, Kendrick & Pramer
Arthrobotrys constringens Dowsett, Reid and Kalker
Arthrobotrys gracilis (Dudd.) Schenck, Kendrick & Pramer
Arthrobotrys strangulans Maupas
Dactylaria dactyloides Drechs.
Monacrosporium acrochaetum (Drechs.) Cooke
Monacrosporium aphrobrochum (Drechs.) Subramanian
Monacrosporium bembicodes (Drechs.) Subramanian
Monacrosporium coelobrochum (Drechs.) Subramanian
Monacrosporium doedycoides (Drechs.) R. C. Cooke & Dickinson
Monacrosporium heterosporum (Drechs.) Subramanian
Monacrosporium stenobrochum (Drechs.) Subramanian
Monacrosporium turkmenicum (Sopronov) R. C. Cooke & Dickinson
Monacrosporium polybrochum (Drechs.) Subramanian

BIOLOGICAL CONTROL POTENTIAL: Little evidence is present to indicate constricting ring trapping fungi have a high potential for biological control. However, these common fungi feed on a number of phytoparasitic nematode genera in soil samples from Florida nurseries and field plantings. What we do not know is the effect phytoparasitic nematodes might have on plant growth if constricting ring and other nematophagous fungi were absent from the soil environment.

LITERATURE:

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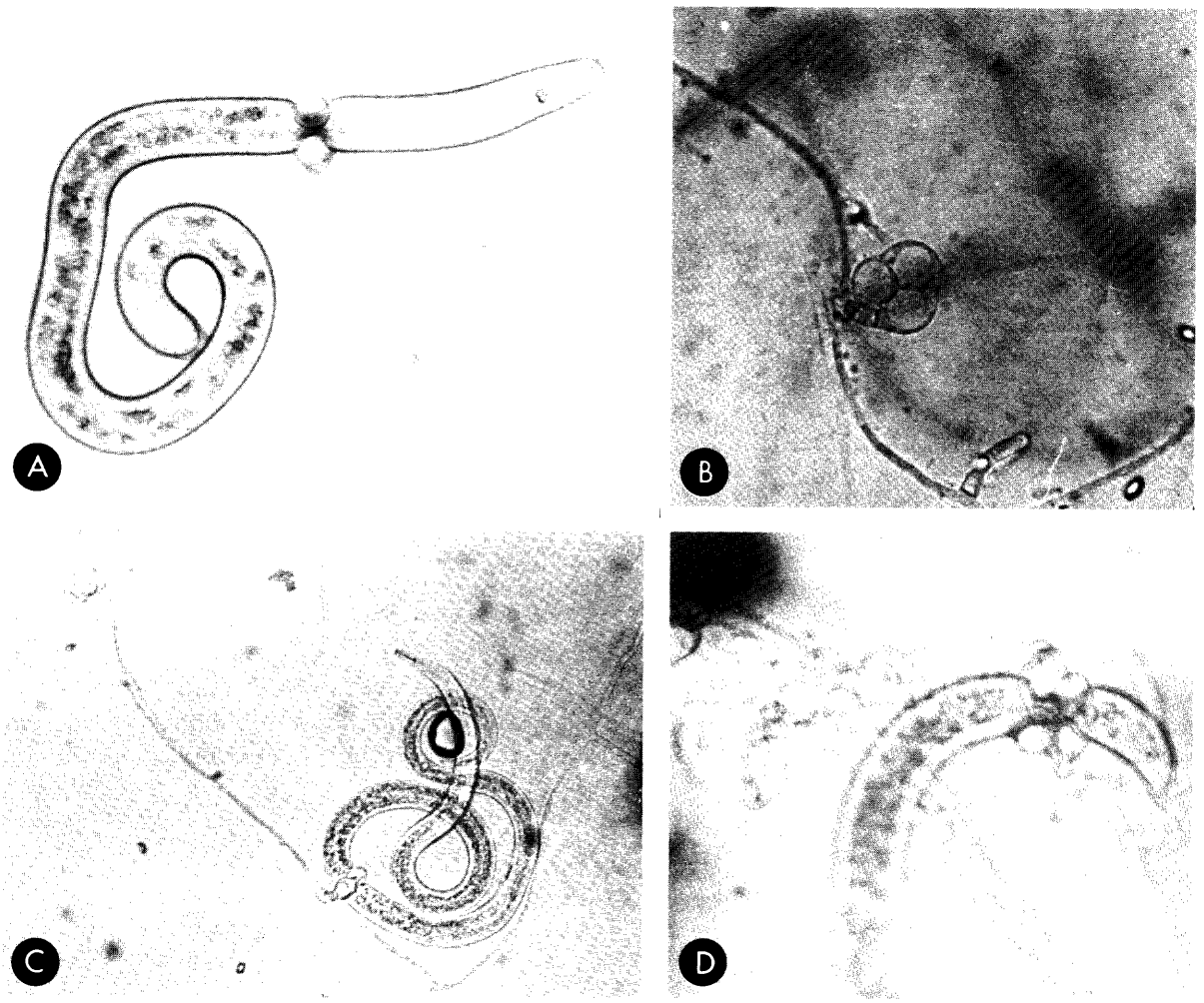

Fig. 2. A. Spiral nematode with closed ring attached. B. Closed ring. C. Pinewood nematode held by a constricting ring. D. Tail of a spiral nematode with 2 closed rings.